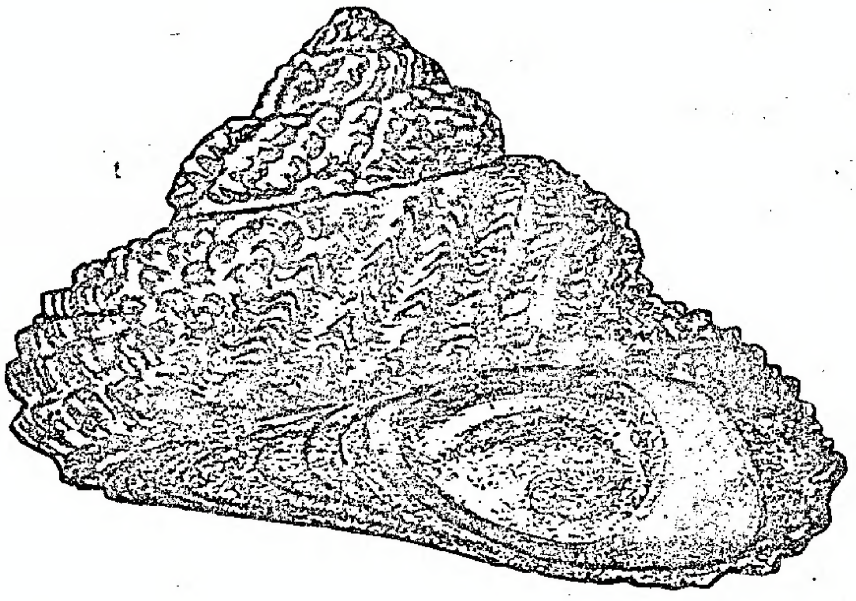
COOKIA



Journal of the Wellington Shell Club

New Zealand

Vol. 5 No. 4 September 1984

A BACKGROUND TO COLLECTING LAND SNAILS IN NEW ZEALAND - A PERSONAL STATEMENT

F.M. Climo September, 1983

.....

INTRODUCTION. All unmodified (natural) plant associations in New Zealand support a fauna of land snails. These snails range in size from 1mm to approximately 100mm in greatest shell dimension. Solem, Climo & Roscoe (1981) give the most up-to-date taxonomic break-down of this fauna and it is not necessary to repeat all that here. Briefly, most of our snail fauna falls in the pulmonate endodontacean families Charopidae and Punctidae which seem, in the main, to be fungivorous or detritus feeders (though the former family has developed a few carnivores). Carnivores of the family Rhytididae and the plant-feeding Bulimulidae are the other major pulmonate sections of the New Zealand fauna. The other big section of our snail fauna falls in the mesogastropod family Liareidae.

I want to concentrate this summary on where to find minute land snail species and how to collect them. Accordingly, I'm leaving discussions on the larger rhytidids (e.g. Powelliphanta), the bulimulids (Placostylus) and the native slugs of the family Athoracophoridae out of this. The large rhytidids of the genera Powelliphanta and Paryphanta and species of Placostylus are protected by law and their collection requires government approval. Private collectors are not likely to get permission to collect them. Although athoracophorid slugs occur throughout New Zealand they require special preservation techniques to be kept in a collection, so are best left in their natural surroundings. The shells of dead snails belonging to the families Charopidae, Punctidae, Rhytididae (other than the protected genera), Achatinellidae, Hydrocenidae and Liareidae can be readily floated from leaf-litter samples taken from natural forest in New Zealand, though, numbers of small rhytidids drop off abruptly south of Cook Strait and the only achatinellid found over much of the country is not found south of central Westland.

In order to understand why New Zealand has such a large number of species of land snail (probably over 1000 species) and why so many live together at one site (up to 60-70 species) we have to examine (in general terms here) what it is that makes this country unique on a global scale - and, let there be no doubt, we are unique and very special. Once that has been outlined we shall examine faunal regions within New Zealand.

A faunal region is a geographic area with its own group of endemic species. The more unrelated species that occupy any particular faunal region the more significant (and important) it is biologically. With respect to land snails, New Zealand can be subdivided into a whole hierarchy of faunal zones. These zones will be discussed below.

New Zealand is characterised by a proportionately high number of minute (below 3mm maximum diameter) land snail species. How does that relate to our geological history and faunal diversity? I'll make some generalisations, there, that can be backed up by my work (unpublished) on Australasian Punctidae.

Some useful orientating headings underwhich short discussions can be presented to lead us into knowing where and how to collect this land snail diversity are:

New Zealand, and global tectonics.
Mountain-building, minor crustal movements, oceans and glaciations.
The structure of vegetation systems, and man.
Snail dispersability and habitat.
A system of land snail faunal zones.
Where and how to collect in the field.
How to extract snails from litter samples.

NEW ZEALAND, AND GLOBAL TECTONICS. Modern technology (radioactive dating techniques; the measurement of fossil magnetism; direct measurements using laser light; orbiting satellites) has left us in no doubt that the earth's crust is composed of jostling plates of light specific gravity rocks that are carried around and pushed into each other by upwelling convection cells that move underlying conveyor-belts of heavier specific gravity rocks. The main ocean floors, with the exception of the continental shelves, are the bits of the heavy-rock conveyor-belt that are not covered by lighter rocks. Down the centres of the main oceans are lines of upwelling (the mid-oceanic ridges) where deep layers of plastic rock come to the top, cool, and flow to each side carrying any lighter perched continental bits along with the flow. Volcanoes (e.g. along the Azores and into Iceland) often occur on these upwelling lines. The light-rock plates crash into each other and push up huge buckles or fold mountains (e.g. Himalayas), or one plate dives under the other in a subduction zone (e.g. Peruvian-Chilian coast of South America; Kermadec Island chain, extending into New Zealand) or these plates slide past each other (e.g. San Andreas fault, California). These slipping and sliding processes cause friction, and melt rocks which burst to the surface as volcanoes.

With few exceptions (e.g. Mt Erebus) volcanoes are associated with either zones of upwelling or zones of subduction.

Being on the boundary of two plates is, therefore, an exciting place to be. Fold mountains are formed and volcanoes abound. This adds an heterogeneity to the topography of an area that could not otherwise be achieved. A diverse altitudinal range, the uplifting of lime-rich marine sediments, and the recycling of nutrient via erosion of volcanic rocks all make for a potentially diverse plant cover. Given enough time, the animals associated with this diverse plant cover will ultimately exploit all the ecological niches (in space and time) that it provides.

Without going into details, New Zealand sits on the edge of two plates, and a major active subduction zone runs into the North Island from the northeast. New Zealand is currently thought to be one splinter of the primeval southern supercontinent Gondwanaland(that was made up of Africa, Antarctica, Australia, * New Zealand and peninsular India), a splinter that broke off Austral-Antarctica sometime between the Cretaceous and lowermost Oligocene (approximately 100-60 million years ago). "Science Express" (T.V.1, August, 1983) summarised this aspect of our geological history. There have never been huge areas of land exposed in the continuity of emergent bits that have revolved and migrated in oceanic isolation until finally assuming the current land-form of New Zealand. There is, probably, more land now exposed than there has ever been (except during the sea-level drops of the heavier glaciations of the last 5 million years or so) and it is probably as rugged as it has ever been; so, we're living in what can be considered the most exciting part of our geological history.

MOUNTAIN-BUILDING, MINOR CRUSTAL MOVEMENTS, OCEANS AND GLACIATIONS. On the larger scale of the previous heading we have seen that whatever snail ancestors we had date back to the early Cenozoic. Since then, with the possible exception of a few easy dispersalists, what the New Zealand snail fauna has done, it has done by itself in oceanic isolation from whatever happened to be on the bit of Gondwanaland that contributed to the New Zealand ancestral splinter. I know of no other comparably diverse and isolated piece of land that has had 60-80 million years to do its thing! Circumstances prevelant over the last 5 million years have meant that New Zealand has been even more favoured from an evolutionary point of view.

The last 5 million years have been unprecendented - within the last 100 million or so - in the New Zealand area specifically (and, in general terms, globally) for mountain-building activity (most of the fold mountain systems are that recent),

* also add South America

volcanic activity and for the violent climatic fluctuations that caused severe temperature changes and major changes in sea-level.

The advantages of being in an oceanic setting during glacial maxima are obvious. Oceanic water has a moderating effect on temperature extremes. We are all aware of the severity of continental winters. As vegetation zones follow isotherms up or down so moves the contained and evolving fauna. Evolving, because the bits of vegetation are not going to survive everywhere in this way (quirks of geography) and original snail distributions (i.e. gene pools) get broken up. New Zealand is essentially a cluster of islands arranged north-south and poking up high enough to cause up-welling of moist air and heavy precipitation over all western areas. The few eastern rain-shadow areas (during periods of dominant prevailing westerlies) add to the habitat diversity by producing more drought-tolerant plant cover. This country has not ever been so geographically extensive in an emergent sense that plant associations have not had time to follow isotherms down the eustatically-exposing continental shelves and slopes (and back up again).

New Zealand was the perfect refugium during times of extreme climatic change. Its latitudinal spread provided north-south temperature gradients of sufficient slope for many warmth-adapted taxa to survive in the north during cold conditions. Conversely, species cold-adapted during (or before) glaciations had had mountains upwhich to retreat during warm spells. These ups and downs, break-ups of ancestral ranges, and remerging of distributions all add diversity to the genetic make-up of organisms, the extreme nodes of diversity appearing as species; that is, biological units now only capable of exchanging and replicating genetic material with others of their kind.

By scanning the N.Z. Jl of Geology & Geophysics of the last 5 years it can be seen that a detailed picture of New Zealand's structural geology is emerging. Graeme Stevens's 1979 book "New Zealand Adrift" is a masterly summary of information on that subject. From these two accessible literature sources patterns of splintering and faulting of the major crustal components of emergent New Zealand unfold. Snail distribution patterns assume more significance when they can be related, either directly or indirectly, to geological forces and structures.

Direct geological events usually involve long-time physical barriers of some sort. Marine straits fall into this category. The Oligocene straits separating E. and W. Northland are probably responsible for strong E.- W. faunal elements in Northland, and the faunal complexity, generally, in that area. Straits of

Pliocene age still separate the Three Kings and Poor Knights Islands from the mainland. Straits of similar age once separated most of the southern North Island fold mountain systems but are now filled in by alluvium or have been elevated by subsequent faulting. More recent straits include Cook Strait, a feature only a few thousand years old.

Indirect geological events involve the role of topography on climatic zones during all phases of glacial cycles and the effect these had on the waxing and waning plant communities. Our technology and civilisation has evolved on the way out of a major glaciation and we are now living comfortably on the transient peak of a balmy interglacial. There is no evidence to suggest that the violent climatic fluctuations that have typified the last (atypical) 5 million years have ended.

We cannot talk of the unique characteristics of the New Zealand land snail fauna without the above brief summary of our geological setting. The geological setting is basic to taxonomic work, provides the skeleton on which to construct phylogenetic ideas on the relationships of one species to another and also provides clues to understanding the biology of the living organism. It is not acceptable to just be a "taxonomist" (a describer and namer of undescribed taxa) in the 1980's. The relationship between morphology and habitat and habitat to biology and habitat/biology to geological events all have to be synthesised and at least partially understood before a species can be named. Anyone can describe and name new species - there are hundreds of them about still. It is a bit more difficult, and more time-consuming, to present a summary of a block of biological history naming new species along the way where necessary. For example, it took Alan Solem 15 years to put together his first volume on the Pacific endodontacean land snails.

THE STRUCTURE OF VEGETATION SYSTEMS, AND MAN. In general, the 3-dimensional complexity of a plant association increases as the component parts get bigger. For example, rain-forest, with several tiers or storeys of plants and a wide variety of organic detritus has more habitat spaces than alpine tussock communities. The sheer volume of forest also protects it from the vagaries of dessication. Dessication is the curse of New Zealand land snails most of which are incapable of forming efficient epiphragms. In general, more species of land snails are found in complex 3-dimensional dessication-resistant habitats than are found in less complex, less 3-dimensional and less dessication-resistant habitats.

Snails can be ranked according to life-style on a dessication-resistance scale. Those requiring very wet slimy habitats usually exploit them by getting large,

decoiling the shell and developing big dessication-intolerant animals. Tightly coiled shells with small apertures and a limited capability to form thin non-calcified epiphragms characterise species from very dry habitats. Snails can also be ranked according to size. Big species, over 5mm diameter say, tend to be surface-rovers and, when not sheltering, occupy "big" spaces. The smallest species (about 1mm diameter) live in the deepest litter layers and probably do not extend far into the "open". See further under next heading.

The continuity of the rain-forest regime, over millions of years in the oceanic New Zealand setting, has given the major groups of snails time to exploit most habitats. This exploitation has involved gigantism on the part of some carnivores (e.g. Powelliphanta) that feed primarily on native soil and leaf-litter worms. A far better way (in terms of numbers of species) of utilising available spaces in rain-forests is to get small enough to develop whole life-styles revolving around, for example, cracks in fallen tree trunks, the cavities between leaves on the forest floor, or the cliff-faces presented by the bark of standing trees.

New Zealand forest litter is, naturally, quite "fluffy" and deep. The absence of hooved animals has meant an absence of compaction forces acting on the litter. Our specially diverse bird fauna meant that "raking" and "scratching" forces were prevelant in the forest scene. The presence of large ground dwelling birds probably aided and maintained this "fluffiness".

Apart from the alpine grasslands (extensive during glacial maxima), the odd area of rain-shadow "scrub' association plant cover and the wind and salt-stunted supralittoral fringe vegetation, New Zealand has always been a group of islands clothed in rain-forest. Parts of it have been decimated by volcanic activity (central North Island), and man is currently causing a wholesale retreat of natural vegetation. Further decimation of our forests, for whatever reason (and most reasons boil down to short-term egotistic behaviour, motivated by greed for money or power - a useful human attribute if it doesn't involve the extinction of other life-forms) must be discouraged.

Our forests are not just groups of trees and other plants. They are the habitat spaces for countless thousands of species of invertebrate whose origins date back to Gondwanian ancestors. If the snail fauna is any indication, less than one third of this globally unique fauna is yet described. A great proportion of these invertebrates disperse very slowly under natural conditions and most require a continuity of the complex forest regime to get from place to place.

We are currently transplanting the post-glacial Northern Hemisphere concept of a forest over huge areas of this country, with scant regard to the destruction of our natural heritage that is taking place in the process. The two types of "forest" are totally different. The man-made conifer forest has few habitat spaces, is composed of only one species, the litter is acidic and does not go "fluffy" or break down and is in most respects, therefore, quite alien to most of our Gondwanian invertebrate life-forms. The huge tracts of conifer forest in the Northern Hemisphere high latitudes are areas of land occupied by only a few "tramp" plants (of large stature, granted) that have migrated into these areas as the ice retreated after the last glacial peak. In New Zealand forest terms, they are analogous to gorse spreading over a burnt-over hillside. Trees are not rain-forests, but the large spaces created by the right combination of trees, through time, make rain-forests.

You might say 'so what'? there are bigger rain-forests in the Congo or South America. The answer is that however large these vast continental tracts of forest are they do not contain the Gondwanian faunal isolate that radiated in New Zealand, and they do not support diverse micro-snail faunas. They are not such old forests as ours and do not contain the huge numbers of species of very primitive snail that could only evolve in the New Zealand setting. Several quirks of geological fate have preserved this ancient invertebrate fauna in New Zealand. We are the custodians of this heritage and have an obligation to preserve it for posterity. To do this we all have to overcome our Judaeo-Christian prejudices and get off the arrogant pedestals that we've built on the misguided assumption that we have any special place in the universe or that our powers of reason give us the right to extinguish other life-forms. A self-orientated (as a species) philosophy is only natural since we, alone and on this planet, are conscious of "self", but it is an arrogant philosophy and one that will ultimately destroy us.

By now it will have become evident that it is not possible to study complex natural systems with any passion without first putting Homo sapiens, a successful "tramp" species, in its correct perspective. As a useful humbling exercise I recommend reading C.A. Ronan's (1982) book "Deep Space", subtitled "Quasars, star probes, black holes, parallel universes, big bang, steady state, alien life, and all the theories and phenomena of the cosmos". Pan Books, 208 pp.

SNAIL DISPERSABILITY AND HABITAT. I've used the word "tramp", above, to describe species. All that that means, is that the animal concerned is tolerant of harsher (for snails, usually a wider tolerance of dessication) environmental conditions or a wider range of conditions than other species that may have very

specific tolerances. "Tramp" usually equates with those acceptable conditions that cover larger areas than those occupied by more specialised species. A bigger area means more continuity of habitat that is acceptable to the species and therefore it makes for easier dispersal of that species over larger geographic areas. "Tramp" species are rapid colonisers of new habitats because these geographic loci are more likely to appear within their sphere of ecological tolerance before those species with more restrictive tolerances. Some snails are, therefore, indicators of certain environmental conditions. They, the tolerant species, usually occur on the fringes of forests.

At the other extreme, some species are lime-loving (calciphiles) and will only survive in areas of high pH, usually on limestone outcrops. Subdivision of the habitat of a widely distributed calciphillic ancestor could, therefore, be seen as a mechanism for the potential origin of new species with very limited distributions. This does occur in the new punctid genus Calcilaoma whose species range from Canterbury to the Kaikoura coast.

Other snails that have developed large slug-like animals become dependent upon their wet (log-jumble, for example) habitats and are usually only found on the wet seepage ground near the heads of or along the banks of water-courses.

Yet others, minute and globular, live only in the deep grainy lower levels of leaf-litter. Still others, minute and flat, live between flat leaves that press against one another in the upper litter layers. And on it goes - some live on tree trunks, some suspended on ferns, others only in tussock, some only on salty seaward slopes, and etc.. Think of a forest space and probably at least one of the 1,000 plus species of landsnail and slug in New Zealand will have made it its own.

Snails, like all organisms, are not active all the time. They obviously have optimum times and conditions for doing the necessities of life - feeding and breeding. We are very short of information of this type on the New Zealand fauna and any studies (undertaken by anyone with an observant pair of eyes) that tell us when and under what conditions a given species is moving about, what it eats, where it shelters when not moving about, what time of the year it breeds, how long it lives, and etc is valuable original research and must be encouraged. Research is not the privilege of paid professionals. It should be a part of the life-long learning process of every individual. Writing down what you see when you open your eyes is research. It implies a movement towards something, and that something is a new level of understanding; a move towards a lesser state of ignorance. The more people there are involved in this step-by step process the

better; because no observation is trivial and such enquiring awareness is a societal plus.

A SYSTEM OF LAND SNAIL FAUNAL ZONES. The New Zealand faunal region encompasses the three main islands, the Kermadec Island chain, Chatham Island Group and the subantarctic islands. Of the off-shore islands, that part of the Kermadec snail fauna that is New Zealand in origin is composed of easy dispersalists that are not specifically distinct from the New Zealand mainland populations. Likewise, the bulk of the Chatham Island fauna (somewhat depauperate to start with) is related to or conspecific with central South Island taxa and the subantarctic fauna is part of the species and generic complexes of southern South Island.

An alalysis of higher punctid phylogenetic relationships (unpublished) backed up by an analysis of other snail families, indicates that New Zealand can be divided into two primary faunal zones:

1. Waikato area northwards.
2. The area south of about Wanganui.

These are primary regions containing their own swarms of endemic genera. Both areas have a number of easy dispersalists in common. While the area in between has its own endemic species, they are not numerous and few endemic genera are involved. Whether or not this comparative faunal simplicity in central New Zealand is due to archaic land distribution patterns or to more recent destructive volcanic events cannot be determined just yet. This pattern can be expressed diagrammatically as follows:

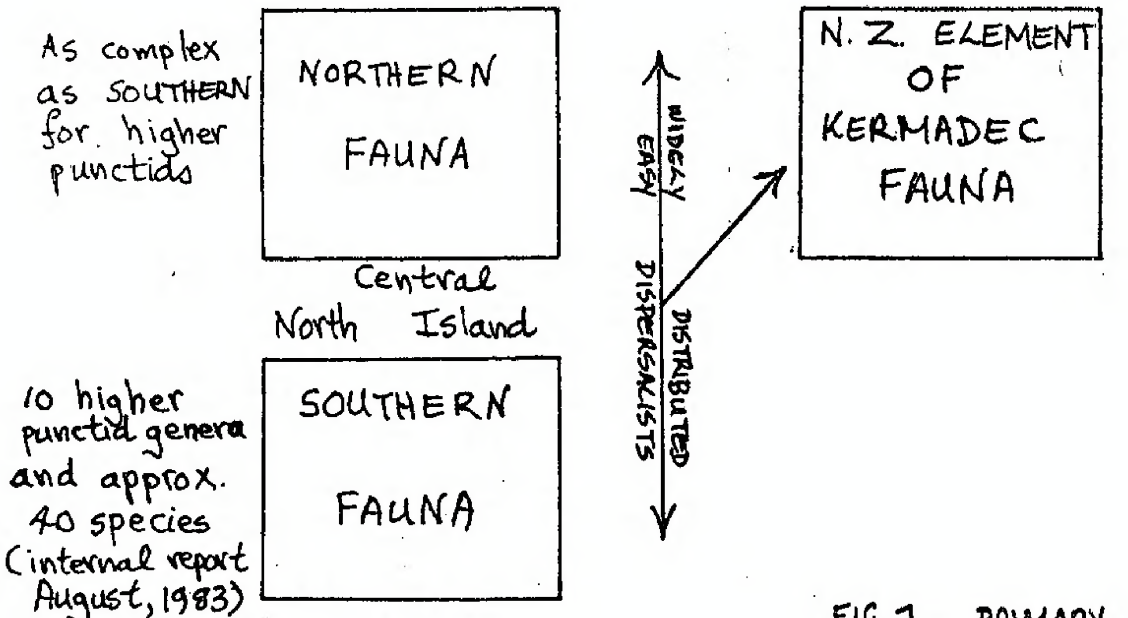

As complex as SOUTHERN for higher punctids
NORTHERN FAUNA
Central North Island
SOUTHERN FAUNA
10 higher punctid genera and approx. 40 species (internal report August, 1983)
WIDELY DISTRIBUTED EASY DISPERSALISTS
N. Z. ELEMENT OF KERMADEC FAUNA

FIG. 1 PRIMARY LAND SNAIL FAUNAL ZONES IN NEW ZEALAND

Some obvious components of the Northern Fauna include Placostylus, Paryphanta, Delouagapia, Rhytidarex, Schizoglossa, Egestula and endemic punctid and liareid genera. Obvious components of the southern fauna are Rhytida, Rhytida (Wainuia), Powelliphanta and endemic charopid, punctid and liareid genera.

As a unit, the Northern Fauna is the one most ecologically threatened for it has Auckland City in its centre and the city is flanked, particularly in the south, by farmlands that utilise the rich volcanic soils of the region. The Northland section of the zone is threatened by land-use changes. These changes involve, primarily, the switch from stock farming to sylviculture. Fire plays a dominant part in land clearance for tree planting and an even more destructive role when the tops are cleared after milling, preparatory to the next planting. These latter fires are of fire-storm intensity and totally destroy any natural forest remnants that might be nestling in gullys and other inaccessible depressions. Even the most destructive stock-farming uses of fire lack the amount of combustible material to totally destroy gully remnants. Certainly, they singe on the edges and shrink over the years but this slow destruction can be partially balanced by changes in public attitudes. The change of land lease or ownership from farmers, most of whom have a "feeling" for the land, to hard-headed business-men who have big profits and share-holders to think of (an acceptable enough view-point) bodes ill for the survival of patches of "useless rubbish". This "useless rubbish" may have no immediate monetary significance but it is home to the real New Zealanders and we, migratory apes with technological skills, should always be aware that we are one species among many. However, we alone have sufficiently ellaborate cerebral circuitry to be compassionate.

Taking the Northern Fauna first, it can be subdived according to distribution of endemic species. Details will be avoided here (they are available, though). Peripheral areas, that have probably been isolated since the Pliocene, can be regarded as subunits of this northern faunal zone, and they are:

1. Three Kings Islands.
2. Poor Knights Islands

Northland itself can be subdivided in two directions E.-W. and N.-S., the former possibly indicating the merging of two land masses that were separated by deep water during the Oligocene, the latter indicating the distribution of islands during the Pliocene. This separation of eastern and western elements continues south as far as the Waikato and Bay of Plenty and the north-south subdivision caused by the Auckland isthmus is well documented and discussed. These finer subdivisions of northern New Zealand can be expressed diagrammatically as follows:

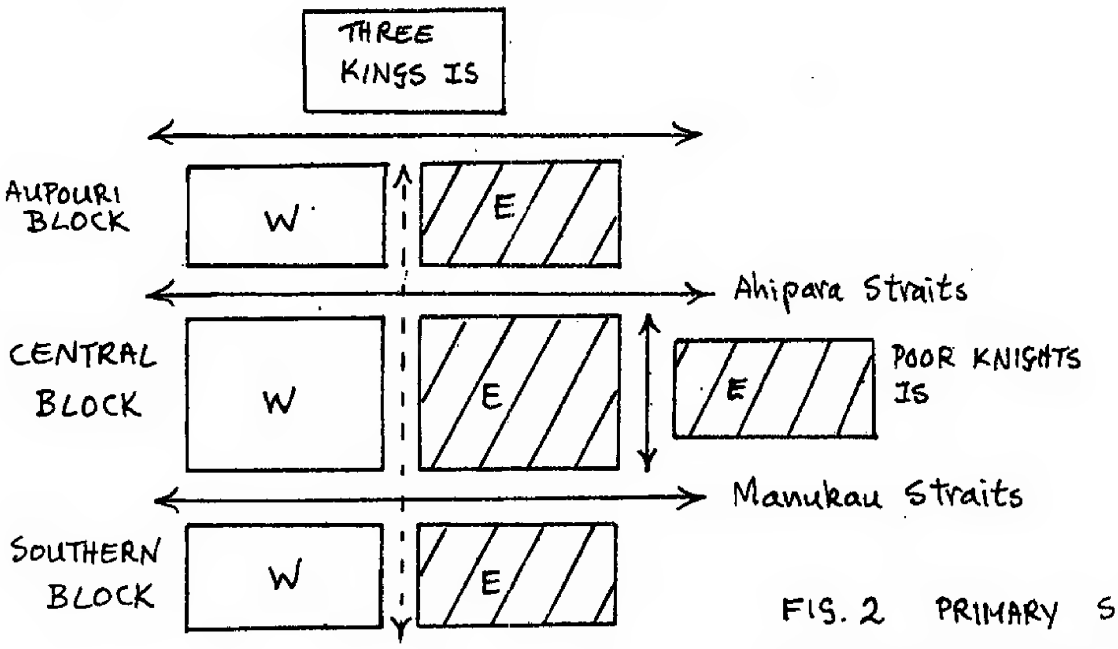
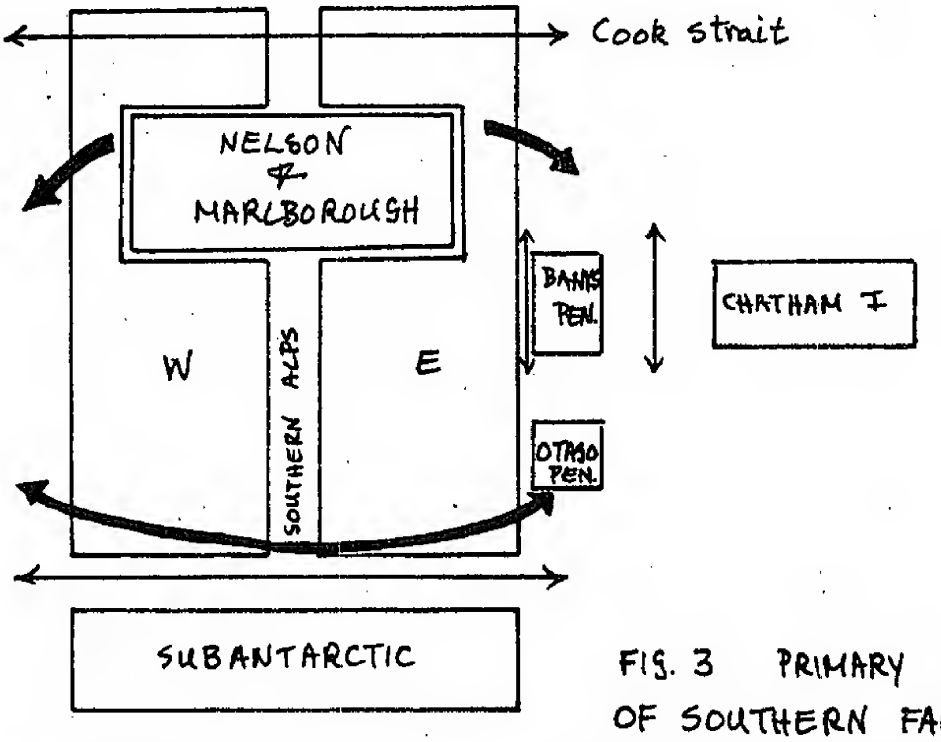


FIG. 2 PRIMARY SUBDIVISIONS OF NORTHERN FAUNAL ZONE, BASED ON LAND SNAIL DISTRIBUTIONS
[⟷ "young" straits
⟷ "old" straits]

As long as forest reserves are fenced and protected from fire within each of the faunal areas shown in Fig.2 there is no reason why the majority (if not all) of this northern invertebrate fauna cannot survive. Properly protected patches of natural vegetation of only a few hectares in extent are sufficient to hold an invertebrate fauna. Solem, Climo & Roscoe (1981) have illustrated this quite clearly. Bird faunas, though, need larger areas of vegetation in which to survive because their habitat spaces are larger and avian life styles are complicated by strong territorial behaviour.

The Southern Fauna extends from about the latitude of Wanganui southwards and its extent is most nearly approximated by the new punctid genus Pryhina. Geographic subdivisions of this fauna seem to involve quite late geological events such as fold mountain formation, glacial truncation of vegetation patterns and marine strait formation. Cook Strait is a minor event, phylogenetically, and plays a part in the evolution of only the latest species to emerge. East-West divisions are strong in central regions, Nelson and Marlborough tend to have their own generic groups, the Chathams, Banks Peninsula and Otago Peninsula are minor areas of endemism, calciphiles have inhabited the limestones of Canterbury and Marlborough and the subantarctic fauna contains a high proportion of "giants". These southern "giants", in several phyletic lineages, have small ancestors that live further north. Stewart Island, although containing genera of both eastern and western affinities is also a region of high local endemism with its own genera. Subdivision of this Southern Fauna can be expressed diagrammatically as follows:



[⟵⟶ faunal mixing N.&S.
⟷ "young" straits]

FIG. 3 PRIMARY SUBDIVISIONS OF SOUTHERN FAUNAL ZONE, BASED ON LANDSNAIL DISTRIBUTIONS

There are areas of endemism within each of the eastern and western blocks of the Southern Fauna. The eastern calciphiles have been mentioned. Western calciphiles also occur on the fringing limestone remnants in Westland with the Punakaiki area being one, and Fox another. Some alpine basins are, also, the only known refugia for some snails (e.g. Hooker Valley).

Speciation on the intervening North Island area between the two main faunal areas seems, in the main, to be quite recent. There are no genera peculiar to that area that do not have quite close southern or northern relatives. With few exceptions, distributions are large over the volcanic plateau, the fold mountain systems and intervening alluvium. Spot endemics (e.g. Cape Kidnappers; Mt Egmont; East Cape, individual axial mountain systems) are not uncommon but there seem otherwise to be no areas more favoured than any other as a faunal refugium.

By collecting litter samples from each of the faunal areas I've indicated it is possible to build up a very comprehensive coverage of our land snail fauna. Eastern areas in South Island are very poorly collected and are sure to yield new species. Any limestone country in Fiordland will prove to be a gold-mine as well. Any area has the potential to provide new species for many of our tiny snails seem to be seasonal and any area will have to be collected every month for a year before we know what lives there. Dead snail shells dissolve within weeks in wet litter so they're not likely to give leads except for short periods.

The trick to collecting this diverse snail fauna is to know where shells are likely to accumulate. Search for places where breakdown of shell material is not likely to be so swift but make sure those places are close enough to potential habitat spaces to collect the shells in the first place. See next heading.

WHERE AND HOW TO COLLECT IN THE FIELD. The lead up to this section will have made it obvious that the local areas producing most species will be those that have had the longest continuity of stable conditions and which are also diverse from a habitat point of view. Vegetation that has been disturbed by stock, by removal of large trees, or partially destroyed by fire will have a reduced number of snail species.

It is, really, up to the investigative collector to search out the places that hold most shells, if getting a good percentage of the species that live in an area is the prime motive. If there is still habitat space left in an area the shelter niches of live snails can be discovered as a secondary exercise. Collecting land snails can be conveniently categorised into three headings:

1. Collecting live, active, snails.
2. Collecting live snails in their shelter niches.
3. Collecting concentrations of dead shells.

1. Collecting, live, active, snails. Some species are nocturnal. Nearly all species are active only if humidity is high. A fall in light intensity usually heralds a rise in humidity, so collect during or after pouring rain, or on misty days if you want to see snails crawling about. They will be crawling on all surfaces. When humidity and/or light conditions are unsuitable, snails retreat to their shelter niches, places that are confined enough to maintain acceptable ecological conditions.

2. Collecting live snails in their shelter niches. This and the above category are "eye-collect" in nature; you get what you see. Some places to examine:

    a. leaf litter on the forest floor
        i. between adpressed damp broad-leaf plant leaves
        ii. in the grainy lower layers
    b. under surfaces of chips, twigs, logs
    c. in the cavities of boulder heaps, screes
    d. under bark
        i. on standing trees
        ii. on logs
    e. cavities inside rotting logs

f. under-surface of leaves of ground ferns, epiphytic ferns or lower-storey shrubs
g. leaf-axils (e.g. kie kie; nikau)
h. inside fallen nikau boles

A quicker way of collecting snails from foliage than by direct examination is to beat or shake the vegetation into a beating-sheet. The size, shape, folding capabilities and materials I leave to the imagination of the collector. The dross that remains in the shake-down centre of the beating-sheet after twigs, leaves and larger spiders (!) have been flicked off (or kept if you know somebody who will use the material constructively) will contain snails if conditions are right.

This sort of collecting is fun and has an inherently high information content, and it is the only practicable way of getting live snails, but it has disadvantages. The collecting methods, a-snail-at-a-time, are time-consuming and the snails are so small that they're easily overlooked. The direct collecting techniques should be complimented by methods that give a better idea of the total snail fauna. These are covered under the next heading.

3. Collecting concentrations of dead shells. Collect where dead shells from a variety of habitat spaces are likely to accumulate. The material to be collected is the black friable organic loam, "fluffy" in character, and usually with a "grainy" appearance. This material rarely gets slimy, seems to dry out fairly fast and, consequently, snail shells in it are not subjected to such a continuous bath of humic acids and remain in good condition longer.

Concentrations of snails can be preserved for thousands of years if the shells fall into high pH habitats such as cracks and caves in limestone or marble. Lime rich (unleached) soils - usually in association with limestone country - also preserve land snails. Caves are, however, special places visually and biologically and deposits in them should not be disturbed except under special circumstances. Common sense should always prevail. The frantic digging of one snail enthusiast can destroy visually something that took thousands of years to accumulate. Appreciate the priorities of others.

When collecting a bag of litter from the forest setting, sample as many types of concentration-areas as possible. If you see one snail there are

sure to be 10 more that you can't see. Some areas to sample:

a. bases of the deepest litter layers
   i. in mamaku groves
   ii. at the bases of fern-covered banks
   iii. in nikau groves
b. under and on up-hill sides of logs
c. in the cavities of rock jumbles
d. around the bases of old, large, trees
e. in cracks and on ledges in limestone rocks or cliffs

Don't assume because some habitats produce few snails in some parts of the country that that will be the case everywhere. Concentrations of snails vary at one locality from month to month as well.

Having got our bag of black loam, how do we get the shells out of it?

HOW TO EXTRACT SNAILS FROM LITTER SAMPLES. The active collectors I know use one or other of two methods:

1. Dry-sort method.
2. Flotation method.

1. Dry-sort method. Dry the sample. Sieve off the larger twigs and leaves that get in. Search them quickly before discarding in case live material is adhering by a thin epiphragm. Sort the fine material, a spoonful at a time, on a white card under a good strong table lamp, or in daylight. A low-power microscope or a stand magnifying glass helps if you cannot, unaided, resolve a point 1mm in diameter. This is thorough and avoids some messy aspects of the flotation technique, but it is time-consuming.

2. Flotation method. For this you require daylight, running cold water, a kitchen sieve of no more than 1mm mesh size and a 2 litre plastic ice-cream container.

   Place a handful of detritus in the sieve. Run cold water into the sieve and shake vigorously until the water runs clean from the sieve. This "concentrates" the detritus by removing air and rinses off chemicals and particles that would make snail recognition on the water surface more difficult. Drop this sample of rinsed detritus into the ice-cream container which has been filled to 2cm from the top with water.

Stir the sediment that sinks and then leave for a minute or two. Empty shells trap air in the shell spiral and float to the surface. These are picked out of the water and placed in a match-box tray to dry. The sorted sample is then tipped back into the sieve over the sink and the detritus discarded into a bucket.

Glass-topped box germination techniques can be used on this forest litter to get native seedlings, particularly if your litter sample came from an exotic setting such as the Poor Knights or Three Kings Islands.

REFERENCE

SOLEM, A., CLIMO, F.M. & D.J. ROSCOE 1981. Sympatric species diversity of New Zealand land snails. N.Z. Jl. Zool. 8: 453-485.

SHELLED MOLLUSCS OF TRANS-TASMAN RANGE.

By W.J.PAUL

In "Cookia" Vol 5 No I (April I982) in the article entitled"Shells Across the Tasman", I commented that the compilation of a definitive list of shelled molluscs whose distribution area extended to both sides of the Tasman Sea could not be satisfactorily compiled for a while yet,and that on-going research would add to the then recognised species in this category. However ,it now appears that major changes will not be made to the presently known species of trans-Tasman distribution ,and the list which follows is presented as a fair assessment of the extent to which the New Zealand molluscan fauna contains species also present in Australia. In a number of cases the New Zealand forms have been given taxonomic status as distinctive sub-species,and suitable notes have been made.

Excluded from the list are:-
Shell-less gastropods.
Pelagic species.
Cephalopods...many of which are pelagic.
Scaphopods...none are known to have trans-Tasman distribution.

In respect of each species a brief description is given of:-
its New Zealand range
its Australian range
its further range,inthe case of species having a wider area of distribution.

Also included are notes of some New Zealand species in Australia,transported presumably by human agency.

For the sake of space the usual abbreviations are used for Australian areas.. Qld.(Queensland), N.S.W.(New South Wales),Vic.(Victoria),Tas (Tasmania), S.A.(South Australia), W.A.(Western Australia), N.T.(Northern Territory), and for generalised areas,the usual geographical abbreviations...N.W.A. = North West Australia etc.

AMPHINEURA

Amaurochiton glaucus (Gray I828)

Throughout N.Z.
In Derwent Estuary , Tas. introduced by human agency,presumably by shipping...specimens are not uncommonly found on hulls of boats

Callochiton crocinus (Reeve I847)

North and South Islands.
South Qld. to W.A. and Tas.

GASTROPODA

Montfortula rugosa (Quoy & Gaimard I834)

Kaikoura Peninsula, Chatham Islands.
N.S.W to W.A.

Scutus antipodes Montfort I8I0

North, South and Stewart Islands.
Qld. to W.A., and Tas.

Gena impertusa (Burrow I8I5)

2 shells of this species were collected by Mrs E.Wolf at Paekakariki In I964...identified by Dr. R.K.Dell...collection of living specimens would confirm inclusion in N.Z. faunal list.

N.S.W., Vic., Tas.

Stomatia phymotis Helbling I779

One empty shell was found near Te Araroa in I972 by Mrs R.E.Duffy. There is no record so far of live specimens being collected.

Nerita atramentosa Reeve I855

North Island.
S.Qld. and all southern coasts,and west coast to Point Cloates, Norfolk Island, Lord Howe Island, Tas.

Littorina unifasciata Gray I833

N.Z.form, sub-species antipodum Philippi I847.....North and South Islands, Chatham Islands.
S.Qld. to North West Cape,including all southern coasts., Tas.

Eatoniella atropurpurea (Frauenfeld I867) =Eatoniella minutocrassa Pondar I965

Throughout N.Z. and Chatham Islands.
S.Qld. to mid W.A.

Notoscrobs incidata Frauenfeld I867

N.Z.form, sub-species maoria Ponder I968.....Spirits Bay to Titahi Bay.
S.E.A.

Maoricolpus roseus Quoy & Gaimard I834

Throughout N.Z. and Chatham Islands.
Has appeared in recent years in Tasmania and southern Queensland... presumably transported by human agency.

Siliquaria weldii Tenison-Woods I876

North Island, Chatham Islands
N.S.W., Vic., S.A., Tas. Norfolk Island

Hinea brasiliana (Lamarck I822)

North Island localities north of Auckland .
S.Qld. to S.W.A.,Norfolk Island, Lord Howe Island, Kermadecs.

Zeacumantus subcarinatus (Sowerby I855)

This N.Z.species is common about Manly,near Sydney.... apparently introduced from N.Z. by human agency, but details of when this occurred have not been ascertained.

Prolixodens infracolor (Laseron I95I) =Cerithiopsis infracolor Laseron

East coast North Island down to East Cape.
N.S.W.

Balcis articulata (Sowerby I834)

Several localities in Northland.
S.Qld., N.S.W. Norfolk Island

Hippomix conicus Schumacher I8I7

N.Z.form..sub-spemies wyattae (Powell I958), east coast of Northland
S.E.A to N.W.A., Norfolk Island.

Krebsia liberatus (Pease I868)

Seven empty shells were found at Moturoa Island, Bay of Islands in I960. There is so far no record of live specimens being collected.
Indo-Pacific...Mauritius to Tuamotus.

Lamellaria ophione Gray I850

North Island and northern part of South Island.
Vic.,S.A, Tas.

Cypraea cernica Sowerby I870

Cape Maria van Diemen to Poor Knights Islands.
Wide ranging in Indo-Pacific...several local forms have been given separate names,

Cypraea vitellus Linne I758

Poor Knights Islands and east coast about Whangarei.

Wide ranging in Indo-Pacific,east Africa to eastern Polynesia.

Trivia merces (Iredale I924)

North Island down to East Cape.
Mid Qld. coast to W.A., Tas.

Volva longirostrata (Sowerby I828)

Poor Knights Islands.
Japan,Philippines, Indonesia,eastern Australia.

Pedicularia pacifica Pease I865

East coast of Northland.
Indo-Pacific, Mauritius to Polynesia.

Natica migratoria (Powell I927)

East coast of Northland down to Whangarei.
N.S.W. ....the species called vafer Finlay I930 appears to be con-specific.

Polinices conicus (Lamarck I822)

Two empty shells were collected at Tauranga Bay,Whangaroa, and several at Takau Bay. No live specimens recorded.

Qld. to W.A., Tas.

Polinices melanostomoides (Quoy & Gaimard I833)

Empty shells have been collected on the east coast of Northland. No live specimens.
Eastern Australia and islands of western Pacific.

Polinices mammatus (Roding I798)

One empty shell found at Takau Bay.
Qld.,N.T., W.A.

Polinices simiae (Deshayes I838)

Cape Maria van Diemen to East Cape.
Qld.,N.S.W., and tropical Pacific to Hawaii.

Polinices tawhitirahia Powell I965

East coast of Northland.
In deep water off Norfolk Island.

Natica sagittata Menke I843

N.Z.form ..sub-species hancockae Powell I97I ,
Bay of Islands.
Southern and western coasts.

Semicassis labiata labiata (Perry I8II)

Northern half of North Island
Portland,Vic. to S.Qld., Norfolk Island.

Other sub-species of labiata....
labiata iredalei (Bayer I935)...South Africa
labiata iheringi (Carcelles I953)...Southern Brazil and Northern Argentina.

Semicassis pyrum(Lamarck I822)

Throughout N.Z. including Chathams.

S.E.A. to S.W.A.,Tas., and South Africa.

Numerous local variants have been given separate names on the strength of minor differences in both N.Z. and Australia.

Semicassis royanum (Iredale I9I4)
East coast of Northland.
Deep water off N.S.W., form hedleyi Iredale I927.

Semicassis thomsoni (Brazier I875)
Deep water off east coast of Northland,and down to Bay of Plenty, S.Qld to N.S.W.

Semicassis bisulcata sophia (Brazier I872)

One dead shell collected at Tutukaka.....only N.Z.record.
S.Qld., N.S.W., Kermadecs.

Casmaria ponderosa perryi (Iredale I9I2)

East coast of Northland.
N.S.W., Kermadecs, Easter Island.

Other sub-species of ponderosa...
p. ponderosa (Gmelin I79I) ..East Africa to eastern Polynesia
p. unicolor (Dautzenberg I926) .... Red Sea, Gulf of Aden, Gulf of Oman.
p. nippomemsis Abbott I968 ...Japan and Bonin Islands
p.atlantica Clench I944...Florida Keys,Bahamas, Caribbean.

Tonna cerevisina Hedley I9I9
Northern half of North Island.
Qld. to Vic.
Fiji, New Caledonia, Norfolk Island, Lord Howe Island.

Tonna cumingi (Reeve I849)
East coast of Northland.
Qld., N.S.W.,
In Indo-Pacific, Indonesia through Philippines to Japan.

Tonna tetracotula Hedley I9I9

Hauraki Gulf, Bay of Plenty.
S.Qld., N.S.W.

Tonna melanostoma (Jay I839)
East coast of Northland.
Possibly in Australia....islands of central and west Pacific.

Tonna tessellata (Lamarck I8I6)
North Island down to Bay of Plenty.
Tropical Australia,Malaysia ,Indonesia,Japan , Fiji.

Tonna zonata (Green I830)

East coast of Northland.
Wide ranging in western Pacific.

Tonna perdix (Linne I758)

Empty shells in far north, no live specimens recorded.
Wide ranging in Indo-Pacific.

Eudolium pyriforme (Sowerby I9I4)

East coast North Island, south to Gisborne.
N.S.W.,Japan, Hawaii.

Malea pomum (Linne I758)

One empty shell at Great Exhibition Bay I973.
Common in tropical Pacific.

Cymatium exaratum (Reeve I844)

East coast of Northland.
S.E.A., to S.W.A.

Cymatium parthenopeum (von Salis I793)

North Island down to Kapiti coast on west, and Hawke Bay on the east.
Qld. and all southern coasts to W.A., Tas., Lord Howe Island, Mediterranean,both sides of Atlantic,South Africa.

Cymatium labiosum (Wood I828)

East coast of Northland.
All east Australian coast, Kermadecs, islands of western Pacific, Philippines, Japan, West Indies.

Charonia lampas rubicunda (Perry I8II)

North and South Islands, Stewart Island.

S.Qld. and all southern coasts to W.A.

Charonia tritonis (Linne I758)

Occasional empty shells have been collected at localities north of East Cape.
Wide spread in Indo Pacific.

Cabestana spengleri (Perry I8II)

North and South Islands, Stewart Island, Chathams.
S.Qld. to S.A., Tas.,Kermadecs.

Cabestana tabulata (Menke I843)

East coast of Northland.
S.E.A to S.W.A.

Sassia kampyla (Watson I885)

Deep water off east coast South Island, Foveaux Strait, Chatham Rise.
Deep water off N.S.W. , Vic., S.A., Tas..

Sassia parkinsonia (Perry I8II)

East coast of Northland, Bay of Plenty.
N.S.W., Vic., Tas.

Argobuccinum postulosum tumidum (Dunker I862)

North and South Islands, Stewart Island,Chathams, Snares,Auckland Islands.

Vic. to S.W.A., Tas.

Fusitriton retiolus (Hedley 1914)

North and South Islands, Chathams, Auckland Islands.

N.S.W., Vic.

Mayena australasia (Perry1811)

North and South Islands.
Qld., N.S.W., Vic.,Tas.to S.W.A.

Tututa bufo (Roding 1798)

East coast of Northland.
Eastern Australian coasts.
In Indo-Pacific widespread.

Bursa verrucosa (Sowerby 1825)

Poor Knights Islands, Bay of Plenty.
N.S.W.,Qld., Lord Howe Island, Kermadecs, Norfolk Island.

Chicoreus ramosus (Linne 1758)

Two collected Takou Bay(empty shells), two collected Tauranga (one said to have been alive)...only N.Z.records.
Throughout tropical Indo-Pacific.

Emozamia licinus (Hedley & Petterd 1906)

Bay Of Plenty
N.S.W. to S.A., Tas.

Galfridus speciosa Angas 1871

N.Z.form, sub-species virginalis,(Suter 1913)
Cape Maria van Diemen, Bay of Plenty.
N.S.W.

Thais orbita (Gmelin 1791)

North Island, northern part of South Island,Chathams.
S.Qld. and all southern coasts to W.A., Tas., Norfolk Island, Lord Howe Island.

Morula smithi(Brazier 1889)

East coast of Northland.
Lord Howe Island, Norfolk Island, Kermadecs.

Morula chaidea (Duclos 1832)

Bay of Islands and vicinity
N.S.W., Lord Howe Island, Norfolk Island, New Caledonia, Kermadecs.

Agnewia tritoniformis (Blainville 1833)

Spirits Bay to Hauraki Gulf.
N.S.W., Vic., Tas.

Muricopsis octogonus octogonus (Quoy & Gaimard 1833)

The typical sub-species in N.Z..... North Island.
Australian form, sub-species umbilicatus(Tenison-Woods 1876)
Vic., S.A., Tas.

Latiaxis lischkeanus (Dunker 1882)

East coast North Island down to Bay of Plenty, Kaipara Heads on west coast.
N.S.W., Japan.

Liniaxis sertata (Hedley 1903)

East coast of Northland.
N.S.W.

Ratifusus adjunctus Iredale I929

Deep water east of Poor Knights Islands.
N.S.W.

Ratifusus reticulatus (Adams I855)

East coast of Northland,and has been dredged off Great Barrier Island.
Vic.,S.A., Tas.

Nassarius glans particeps (Hedley I9I5)

East coast of Northland.
N.S.W.

Nassarius spiratus (Adams I852)

East coast of Northland.
N.S.W.to S.W.A.

Pleuroploca filamentosa (Roding I798)

One half grown specimen in a cray pot near North Cape
Wide-spread in tropical Indo-Pacific.

Fusinus genticus (Iredale I936)

East coast of Northland and off-shore islands.
N.S.W.

Fusinus novaehollandiae (Reeve I848)

One shell recorded at Ohope Beach,Bay of Plenty , and one at Opoutere Beach, Coromandel.
N.S.W., Vic., S.A., Tas.

Latirus gibbulus (Gmelin I79I)

One collected at Miniwhangata Beach I963.
West tropical Pacific.

Peculator porphyria (Verco I896)

Deep water off far north of North Island.
Vic.to S.W.A., Tas.

Waimatea obscura (Hutton I873)

East coast of North Island south to Cape Runaway.
Vic.,S.A., Tas.

Mitra carbonaria Swainson I822

North Island, as far south as Plimmerton.
N.S.W to W.A., Tas.

Marginella mustelina (Angas I87I)

Northern half of North Island.
N.S.W. to S.A.

Lophiotoma abbreviata (Reeve I843)

One dead shell found in N.Z.
Wide stread in Indo-Pacific

Conus howelli Iredale I929

Several North Island localities southwards to Bay of Plenty.
N.S.W.,Elizabeth Reef,Lord Howe Island,Wanganella Bank, S.Qld.

Conus kermadecensis Iredale I912

Parengarenga Harbour to Bay of Plenty.
Qld., N.S.W., W.A., Norfolk Island.
Japan, China Sea, east coast South Africa.

Terebra circumcincta Deshayes I857

Bay of Islands
Qld.

Architectonica reevei (Hanley I862)

East coast of Northland to Bay of Plenty.
S.Qld. to W.A..

Philippia lutea (Lamarck I822)

East coast of Northland to Bay of Plenty.
N.S.W. to W.A.

Philippia oxytropis Adams I854

East coast of Northland.
N.S.W. to N.W.A., Lord Howe Island, Cook Islands, Hawaii, Japan, New Caledonia.

Philippia radiata (Roding I798)

East coast of Northland.
N.W.A. to N.S.W.,
Indo -Pacific from Red Sea and East Africa to Japan and Hawaii.

Heliacus costatus (Schepman I899)

Deep water off Three Kings Islands.
N.T., Qld., N.S.W.

Heliacus asperus (Hinds I844)

Bay of Plenty.
N.W.A to N.S.W.
Philippines.

Pseudomalaxis nobilis meridionalis (Hedley I903) = Mangomuia bollonsi Maestayer

Off North Cape.
Qld, N.S.W.
Japan.

Opimilda decorata Hedley I903

N.Z.form...sub-species aupouria off North Cape.
Typical subspecies , N.S.W.

Epitonium minora (Iredale I936)

East coast of Northland.
N.S.W., Vic., S.A., Tas.

Epitonium tenellum (Hutton I885)

East coast North Island down to Bay of Plenty.
Qld., N.S.W., Vic.

Epitonium perplexum (Pease I867)

East coast of Northland.
Qld., N.S.W., Tas., S.A., W.A.

Triphora ampulla Hedley I902

North Island.
N.S.W.

Bullina lineata (Gray I825)
Spirits Bay to Bay of Plenty.
Qld.,N.S.W.,
Widely distributed in tropical and sub-tropical Pacific.

Hydatina physis (Linne I758)
East coast of Nprthland.
Wide spread in Indo-Pacific from East Africa to Japan and Hawaii.

Hydatina alobcincta (Van der Hoeven)
One shell collected at Tutukaka,I970.
Northern coasts of Australia, Japan.

Cylichna thetidis Hedley I903
Several localities north of Auckland.,both coasts.
N.S.W.

Philine angasi Crosse & Fischer I865
North Island ,from Auckland northwards.
N.S.W.,Vic., S.A., Tas.

Bulla quoyi Gray I843
Most of North Island, Nelson.
Qld. to S.W.A., Tas.

Bulla angasi Pilsbry I893
Northland.
N.S.W., Lord Howe Island, Norfolk Island, New Caledonia,
Kermadecs, Western Samoa.

Atys naucum (Linne I758)
East coast of Northland, Hauraki Gulf.
Tropical Pacific, Japan.

Limulatys reliquus Iredale I936
East coast of Northland.
N.S.W.

Umbraculum sinicum (Gmelin I79I)
East coast of Northland.
Wide spread in Indo-Pacific,including all tropical and
sub-tropical Australia.

Gadinalea conica (Angas I867)
Throughout N.Z. and at Chathams.
S.Qld., to S.W.A., Tas.

BIVALVIA

Neilo australis (Quoy & Gaimard I835)
Throughout N.Z.
This Z.N.species has been collected in the Derwent Estuary,
Tasmania....presumably transported by human agency.

Anadara trapezia (Deshayes I839)
Sub-fossil only in N.Z. in the far north.
Qld. to W.A., Tas.

Mytilus edulis Linne I758
The species is almost world-wide with regional sub-species
in several areas.
N.Z.form ..sub-species aoteanus Powell I958 ,throughout
N.Z. and to Sub-Antarctic islands.
Mytilus edulis planulatus (Lamarck I822) in southern
Australian waters.

Septifer bilocularis (Linne I758)

Off Mayor Island.
Qld., and tropical Pacific

Xenostrobus pulex (Lamarck I8I9)

Throughout N.Z. and sub-Antarctic islands.
S.E.A. to S.W.A., Tas.

Xenostrobus securis (Lamarck I8I9)
Throughout N.Z.
Mid Qld. to W.A.

Gregariella barbata (Reeve I858)
Throughout N.Z. and Chathams.
N.S.W. to W.A. Tas.

Pteria levitata (Iredale I939)
Poor Knights Islands.
Qld.

Crassostrea gigas (Thunberg I793)

This Japanese species has apparently been accidently introduced to N.Z. It is farmed in S.A. and Tas.

Thyasira peroniana Iredale I930

N.Z. forms....
(a) sub-species peregrina (Iredale I930)
South Island, Stewart Island, Chathams.
(b) sub-species waikanae Fleming I950
Waikanae Beach
peroniana peroniana...N.S.W.

Thyasira resupina Iredale I930

N.Z.form...sub-species neozelanica (Iredale I930)
North And South Islands.
resupina resupina ...N.S.W.

Montacuta semiradiata Tate I889

N.Z.form sub-species neozelanica (Dell I956)
Deep water off North Island and Chathams.
Typical species Vic.,S.A.

Montacuta vitrea Laseron I956
N.Z. form..sub-species aupouria Ponder I968
East coast of Northland, Three Kings.
Typicalspecies N.S.W.

Divarilima sydneyensis (Hedley I904)

East coast of Northland, Three Kings.
N.S.W.

Limaria orientalis (Adams & Reeve I850)
East coast south to Auckland...first recorded I972, now common.
N.S.W.,Vic., S.A.
Japan, Philippines.

Monia zelandica (Gray I843)
Throughout N.Z. and sub-Antarctic islands.
Qld.To W.A. ,Tas.

Benthoquetia integra (Hedley I907)

East coast lower NorthIsland, east coast South Island, Chatham Rise.
N.S.W.

Theora lubrica Gould I861

Auckland and northwards.
Qld. western Pacific to Japan

Venerupis largillierti (Philippi I'49)

Throughout N.Z. and sub-Antarctic islands.
Introduced by human agency to eastern Tasmania.

Hiatella arctica (Linne I758)

Throughout N.Z.
Almost world-wide.

Poromya laevis Smith I885

off Three Kings
Qld.

Myochama tasmanica (Tenison-Woods I877)

Parengarenga Harbour
Tas. N.S.W.

Spinosipella ericia (Hedley I9II)

Off Three Kings.
Qld. to S.A.

Bankia australis (Calman I920)

North Island and northern part of South Island.
Qld.

Nototeredo edax (Hedley I895)

North Island.
N.S.W. to S.A.

Cleidothaerus albidus (Lamarck I8I9)

North Island and Chathams
N.S.W. to S.A., Tas.

Offadesma angasi (Crosse & Fischer I864)

Throughout N.Z. and Chathams.
N.S.W to S.A., Tas.

REVISION OF THE NEW ZEALAND SPECIES OF SIPHONARIA

W.J. Paul

Mr B.W. Jenkins of Sydney has made a major revision of the New Zealand species of Siphonaria in a paper entitled "Redescriptions and Relationship of Siphonaria Zelandica Quoy & Gaimard to S. Australis Quoy & Gaimard with a Description of S.propria sp.nov", in the Journal of the Malacological Society of Australia, Vol 6, June 1983.

We have generally recognised three species of Siphonaria in New Zealand .....

Siphonaria zelandica Quoy & Gaimard 1833
S.australis Quoy & Gaimard 1833
S.cookiana Suter 1909

Jenkins has now established .....

1. That the name S.zelandica does not correctly apply to any New Zealand shell, but is applicable only to an Australian species which has gone under several names in various parts of Australia.

2. That the shells we have recognised as S.zelandica and S.australis are in fact ecological forms (high and low water forms) of one species ... S.australis.

3. That the shell we have recognised as S.cookiana is in fact nameless, and he has given it the name S.propria Jenkins 1983.

1. Siphonaria zelandica Quoy & Gaimard 1833

The type locality given by the authors was "New Zealand" ... Jenkins's comment is "erroneus; undoubtedly from Australia", the description fits an Australian species ranging from Keppel Bay, Queensland, right round the southern coast of Australia and up the west coast to Broome, but not including Tasmania.

The following species hitherto recognised as separate are now to be treated as synonyms of zelandica:-

S.baconi Reeve 1856 ... type locality Swan River, West Australia
S.zebra Reeve 1856 ... Type locality Port Jackson N.S.W.
Planesiphon elegans Iredale 1940 ... type locality Keppel Bay, Queensland.

2. Siphonaria australis Quoy & Gaimard 1833

As stated above the shells formerly recognised as S.zelandica and S.australis are both forms of one species, S.australis. It is distributed throughtout the North Island, South Island and Stewart Island, and is at Chatham Islands, Snares Island and the Auckland Islands. It does not occur at Kermadecs, Bounty Island or Antipodes Islands.

Type locality is Cook Strait.

3. Siphonaria propria Jenkins 1983

To quote the author .. "The species referred to by New Zealand workers as S.cookiana is indeed a distinct species but unfortunately Suter's type series contains more than one species. Sunsequently designation of lecto-type material has further confused the situation because the specimen she (Boreham 1959) chose as the lectotype is in fact a juvenile of what is here considered S.australis, and so S.cookiana becomes a synonym of that name. The other six specimens of Suter's type series of S.cookiana are actually distinct from S.zelandica and S.australis and require a new species name".

Type locality ... lower littoral, south side of Kaikoura Peninsula.

The species is distributed throughout the North Island, South Island, Stewart Island, and is present at the Chathams. It has not been recorded from any islands south of Stewart Island.

As a result of Mr Jenkins's paper, both New Zealand and Australian collectors will have the task of re-labelling parts of their collections.

In short, in New Zealand we have two species of Siphonaria ... the species formally called cookiana, and now to be called propria, and all other populations are australis.

Regarding the type locality of S.baconi, which was recorded as "Swan River", it should be noted that this does not mean the Swan River at Perth. The State of Western Australia was originally called the Swan River Settlement. Many species of shells collected on the west coast of Australia early in the nineteenth century have the type locality "Swan River" which means to say they were collected somewhere on the west coast of Australia.

A TREASURE TROVE AT TAUPIRI BAY

by P.R. Jamieson

Well known to northern collectors is a small bay on the north eastern aspect of the Whangaruru Peninsula called Taupiri Bay. Discovered by shell collectors some years ago now, this little halfmoon of sand enclosed by rocks at either end, has continued to yield a treasure trove of small shells to the careful collector. At first appearance the beach would seem almost bare a few meagre looking tide lines, consisting of gravel and old broken shell, typical of many northern beaches. The secret here is time, and careful patient searching on all fours along these tide lines to extract the goodies from amongst the rubble. Many rare species have been collected here over the years, sometimes in good numbers. Even though this little beach is frequently visited, it seems almost impossible to come away empty handed, as every tide turns over the rubble yet again, revealing new shells previously covered.

Taupiri Bay is reached by typical rough Northland gravel roads from either Opua in the North (via the car ferry) or north of Hikurangi in the south. Time must be allowed for this earth shattering dusty journey !! Pulling off the road opposite the Pohutakawa Trees, a little track then leads down to the beach. I first visited here in February 1983 with Jenny Raven. In my usual exuberance I leapt out of the car, ran down to the first tide line, bent over and in one foul swoop picked up a worn but large pale yellow Pterotyphis eos and a single value of Gomphira maorum (the latter is rarely found south of the far north block). All this much to the dismay of Jenny (I nearly had to walk home). Further searching produced a large beautiful Balcis articulata (obviously very fresh judging by the shell), another Gomphina value, a number of small but nice Haliotis virginea crispata and some other 'bits and pieces'. Time was limited however, and I am sure a more intensive search would have produced more.

Eager to return here again, this was a 'must' on the agenda of places to visit when I went north with Eric Scott in August 1983. We were joined by Kevin Burch, wife Judy and thei young daughter from Whangarei. It was an ideal day for a picnic at the beach, but us shell collectors were too busy with heads down to worry about lunch ! Horrors, we were joined by more people, but fortunately not shell collectors, just sun seekers. So we continued merrily, with eyes to the ground, as if praying to mecca, carefully searching each tide line in turn. Then turning around and going over the same ground again. (Its amazing what you missed first time round !!). Our on lookers watched us suspiously, and I'm sure they thought we were quite mad when the silence was broken by a WOOPY ! or YAH HOO !, as another rary came to light ! The biggest of these came from Judy who was at the far northern end of the beach at the time. It sent the rest of us scampering from the other end. Her treasure - a hughe Bullina lineata, unfortunately minus apex, but what a find.

Eric turned up trumps with his beautiful Nassarius spirata, one of the best I've ever seen. It was Kevin's day for Trivia merces, he found several, while Eric had turned up yet another, and another, and another Balcis articulata !! Not all perfect, but I didn't hear any complaints. I did my fair share of hooting and yelling too, especially when I turned up three 'firsts' for me - Polinices simiae, Marginella Maoriana and Neoguraleus sandersonae. I was only inches away when Kevin found his perfect Peculator hedleyi a fresh monster. And still we kept finding things - Muricopsis octogonus, Muricopsis espinosus mariae, lovely Emarginula striata, Haliotis virginea crispata, Turbo grarosa (small), Marginella mustelina, single values of Cardita brookesi and Acar sandersonae, beatuifully coloured examples of Amalda novaeselandiae and Glycymeris modesta, more Trivia merces and Balcis articulata, one each of Clanculus peccatus, Maurea osbornei (small), Philippia lutea, Natica sagittata hancockae and Bulla vernicosa, a red but worn Pterotyphis eos, and two Natica migratoria.

After awhile we moved up onto the rocks at the northern end. Alive in rock pools were Maurea punctulata and Cantharidus opalus. I also found a complete Austrotriton parkinsonia with hermit crab, but alas old and incrusted. I quickly noticed that among these rocks were patches of very good looking shell sand packed with little treasures. So it was back to hands and knees again. We had hardly started when Kevin found a beautifully fresh Polinices simiae, but then it was my turn with a very good Waimatea obscura, large, beautifully coloured and patterned. Other items in evidence by broken specimens were Agnewia tritoniformis, Morula smithi and Siliquaria weldii. Bags of shell sand were taken for later more careful sorting for the minute species. Little did I know it at the time, but because of this, the best item as far as I was concerned was yet to come !

And so regretfully we left this delightful spot. It seemed as though I could have searched forever. I wonder how many jewels we left unnoticed on the beach that day. Hopefully the next person was lucky enough to find them.

On returning home my shell sand sat outside for a good few weeks till the larger material from the trip was sorted and cleaned. It wouldn't have if I had known what was in it. When the time came to sort it, I spread it on paper to dry as usual. Then I began the job of sieving it into various sizes for easier picking. The coarsest sieving was mostly stones and broken shell pieces, so I tipped it to one side. As I did so, out it popped. I sat there and glared at it in disbelief, I suppose because of the colour. I remember I then made so much noise someone thought I'd found a cone !!! So what was it ?? A beautiful bright yellow Pterotyphis eos, so fresh with complete unworn frills. What amazes me most was that the frills were striped with dark brown. Now I've seen completely yellow P.eos and light brown ones with dark stripes, but never the combination. But that wasn't the only item of interest in the shell sand. I was thrilled to also find one of the treasured Zelippistes benhami.

Eric found one in his shell sand also, along with another Pterotyphis eos !! I also found another Marginella maoriana, a complete Gomphina maorum, and at last, two Peculator hedleyi !, but not as good as the beauty Kevin found. As the sieving got finer, so the number of species increased. It's going to take me forever to identify them all, but there are some very interesting species amoungst it. A final tally will reach over 200 species in the shell sand alone. A few of the more readily identifiable species include at least six species of Merelina - genmata, lyallina, superba, taupoensis, crosseaformis and coronata. The latter is particularly spectacular. Others are Eulima perspicua Triphoro aupouria, ampula, and infelix, Crossecla vesca, Notoscrabs ornatus, Powellisetia unicarinata, Lodderia waitemata, Estea impressa, Zerotula ammonitoides, Acar sociella, Subonoba candidissima, Teretianax pagoda, Incisura lytteltonensis, Scissurona rosea, Nepotilla nitidula, Marginella vidae, Larochella alta, Jinezona laqueus, and Caecum digitum. Of interest to me, was that many of the species found in the shell sand were listed by Powell in his Manual of New Zealand Mollusca as known only from one locality - eg Tom Bowling Bay, Rangauna Bay, Great Barrier Island, Hen and Chicken Islands. So obviously many species are much more widely distributed, along the Northland east coast.

The variety of species obtainable at Taupiri Bay seems endless. Everyone who goes there seems to find something different, and the species listed above are only a small portion of what has been found there. A complete list of species obtainable at this locality would be spectacular. So make Taupiri Bay a 'must' on your next trip north.

A TRIP TO WESTERN SAMOA

by M. Taylor

After an overnight stay in Auckland we left the motel for an early (7.30 am) flight to Western Samoa. Imagine our dismay to find 4 planes leaving around the same time so it was 'every man for himself'. However we did manage to get away (although rather late) and found ourselves blocked into our seats with a very large Samoan lady with a huge plastic bag of funny hats, apparently for wearing to church in Apia as everyone turns out in best 'bit and tucker' - a very impressive sight. We touched down very briefly at Tonga and had our first experience of tropical heat - remember it was winter in N.Z. Tonga seemed quite flat, but well cultivated, mostly coconuts as far as we could see.

A few more hours and American Samoa came into view and then Faleola airport at Apia. We were in Western Samoa at last. On seeing the crowd behind the barrier we guessed that the arrival of a plane must be the entertainment of the week as there were about 6 people to every passenger on board.

We had very low tides for the next week, in fact, the lowest for 60 years, so had to do some gentle 'arm twisting' to make sure we were able to visit at least a few beaches.

The shallow water by the Yacht Club proved to be a very good area for shells as the falling tide exposed extensive sand bars which were covered by rather short but dense seaweed. On this were hundreds of small cowries, Cypraea moneta, moving about. These are a beautiful blue when seen through the water. Also caught in this seaweed were Strombus gibberulus, S.mutabilis, and a few Cypraea asselus. On sandy patches large numbers of Tellina stairella were stranded, the colours ranging from pink to a clear yellow. Nearer the shore we found ample supplies of Gafrarium tumidum, Polinices and several meritas, with Nerita plicata predominant. My best find this day was a beautiful fluted clam, not long dead. These are quite hard to find in pairs as one valve is mostly stuck fast in the sand.

At a later date we were to add from the same spot several Cerithium, Spondylus ducalis, Gafrarium pectinatum, and a small brown shell which could be an ellobiid, but as yet I have been unable to name it.

The following few days were for sightseeing on various beaches but please don't ask me to repeat the names. On one of these we gathered Drupa racina, D.grossulana, and large pieces of D.morum, I suspect remants from a beach barbeque. They are popular with the natives because the animals are quite sizeable, unfortunately they break all the shells.

Our next shelling was on the reef which we arrived on per yacht, it was quite something to see all that coral exposed as the water receded and we saw all the weird and poisonous creatures in the pools. However as we were intent on gathering shells we had to move on before the incoming tide swept us off. Bivalves in the area included Tapes phillippinarium, Asippus violascens, Periglypta reticulata, P.purpurea, Venus mercinaria, Arcopagia Robusta, several venerids, as well as cockles.

Cones were found in the pools and although most were small, they were varied:- Conus lividus, C.vitulinus, C.striatus, C.pulicarius, C.eberneus, C.chaldeus, C.sponsalis, C.coronatus, and one lone C.mustella. In the vicinity were also a few Vasum turbinellum. By this time the tide was letting us know it was time to move on and do some shell cleaning which is quite a job with shells from the coral. We also had to keep a wary eye on the ants which were so tiny but quite capable of moving off with the smaller shells.

On the rocky coast near the airport we found an abundance of pink periwinkles, very pretty, but hard to collect as they seemed to sense our intentions and dropped down into the narrow crevices. There were also numerous Planaxis sulcatus and under the rocks we were lucky enough to find one beautiful Cypraea mauritiana. There are plenty of these apparently but it takes a sharp eye to spot them as they are dark coloured and well hidden under the rocks, mostly in crevices.

By this time our holiday was nearing the end so we had one more day on the reef, this time at Palola Deep. This reef runs well out into the open sea with a very deep channel on the sea side. We had to walk carefully here as there was plenty of marine life in the pools, and many poisonous creatures lurking about, including urchins with long sharp spines and hairy grey-white 'caterpillars' with wicked bristles. The coral here was all dying but some pieces still had their brilliant colour, and beautiful small fish were darting about. Not so colourful were the sponges, a gull grey, and sea slugs which the natives were gathering with great glee as they are not often so accessible. We saw some in bottles in the market and all I can say is UGU !

Of course the Samoans thought we were quite crazy gathering empty shells. We had our most exciting experience as we got nearer the deep area of the reef. Here we came across a strange but beautiful mass and as we crouched closer to identify it the blue and orange colour of the mass grew very intense and the mass began to vibrate. Before we could recover from our shock the creature gave a huge sigh and opened one eye. We were 'eye-ball to eye-ball' with one of the most poisonous of the octopus family. Somehow our courage desserted us and we made a very undignified escape from the area - the alternative was to dive into the deep channel and risk a tussle with the very big sharks cruising about. It was now time to get down to business as the tide was coming in rather fast and threatening to cut us off. Astrea rhodostoma were quite common but we really had to search for Coralliophila violacea, the lovely purple coral shell, and Peristernia nassatula, also with a purple mouth. Most of the shells in the pools were inhabited by hermit crabs, but there were other types of crabs also, including huge orange ones with white spots, but on seeing the size of their nippers we left them alone.

On the way back to dry land there were a few Trochus maculatus and T.fenestratus so they were popped in the bag, along with a small tapestry turban, several Bulla vernicosa, Terebra crenulata, and T.felina.

That really brought our shelling in Samoa to a close, as the tides were now against us and we were reduced to picking up the odd shell around the harbour. Our last adventure was to the Piula Caves - a quite large freshwater pool just a few yards from the sea. This ran back into a cave which in turn into another cave through a narrow underwater passage. We climbed into our snorkelling gear and went swimming around in the dark - very eerie but good fun. The small fish seemed quite amazed at our 'invasion' - it certainly was strange seeing fish swimming above us.

One item of interest was the monastry perched on top of the caves, maybe they served as a good hiding place for treasure in days gone by. Anyway, we like to think so.

Our time in Western Samoa really was at an end by now so we had to bid Upola a sad farewell and hope that we are able to return before too long. Western Samoa has such a lot to offer.

COLONIAL KNOB FIELD TRIP

by P.R. Jamieson

Saturday the 24th of September dawned one of those miserable Wellington days of high winds and drizzle. However this did not deter a keen group of club members and members of their families from participating in a field trip to Colonial Knob, Porirua, in search of small land snails. The trip was led by Dr Frank Clime, as a follow-up to his talk at the September meeting on collecting small land snails.

Colonial Knob is a reasonably large bush area on the eastern aspect of the hillside above Porirua City. Much of this was heavily milled earlier this century, consequently the remaining bush is mostly second growth. Usually second-growth bush harbours fewer species than virgin bush, but because of ease of access, and a central locality, this was chosen as the venue for the field trip.

10.00 am was the meeting time at the Ministry of Works and Development public carpark, and shortly after this we walked a short distance up the Colonial Knob walkway. Thinking the gullies would be the most intact and untouched parts of the reserve, we left the track and started up the first stream and small valley we came to. From then on it was simply a metter of scratching round on hands and knees amoung leaf litter, around the bases of ferns (especially black Manuka tree fern) and sedges, under logs and on tree trunks, in search of these tiny snails. Some members took home a quantity of leaf litter for later sorting by the little float method which Dr Climo demonstrated at the last club meeting. Others were content with what they found directly by sight.

Dr Climo has since given me a list of the species he obtained from four bags (approximately 2-3 litres) of litter, and I have here used this to compare with what I obtained by direct sight only. The value of the litter collection method will be immediately obvious, as this method resulted in twice as many species and alot more specimens being obtained.

SPECIES	NUMBERS	
	Leaf litter float F.M.C.	Direct sight P.R.J.
Omphalorissa purchasi (Pfr)	31	
Cytora lignaria (Pfr)	1	
Lamellidea novoseelandica (Pfr)	1	
Charopa coma (Gray)	43	6
"Charopa" bianca (Hutton)	1	
Cavellia anguicula (Reeve)	1	5
Cavellia biconcava (Pfr)	11	1
Cavellia brouni (Suter)	1	
Cavellia buccinella (Reeve)	2	2
Huonoden pseudoleida (Suter)		2
Mocella eta (Pfr)	12	2
Phenacharopa novosaelandica (Pfr)	4	
Therasiella noezelanica (Cumber)	3	
"Flammulina" perdita (Hutton)	1	
Therasia zelandiae (Gray)	1	3
Allodiscus N.sp. cf Tessellatus	6	1
Pseudallodiscus ponderi (Climo)	1	2
Phenacohelix rusticus (Suter)	6	1
Laoma marina (Hutton)	8	
'Punctid' allochroida (Suter)	1	
'Punctid' lateumbilicata (Suter)	6	
'Punctid' n. sp. 29	4	
'Punctid' phrynia (Hutton)	9	
Rhytida (Wainuia) urnula (Pfr)		4
Total numbers collected	154	29

PENCARROW FIELD TRIP

P.R. Jamieson
K.R. Grange

Waitangi Day 1984 saw 5 Wellington Shell Club members brave a strong and reasonably cold southerly to walk from Eastbourne towards Pencarrow Light and take advantage of the predicted low tide. The onshore winds, however, prevented the tide from dropping properly and prevented most of us from scrambling over the rocks to search for live molluscs. The afternoon still proved very successful and, as the following list shows, 40% of the species collected this day were not recorded during a similar field trip in January 1979.

* = seen alive
\+ = not recorded W.S.C. trip 1.4.79

POLYPLACOPHORA:

* Amaurochiton glaucus (Gray, 1828)
+* Sypharochiton pelliserpentis (Quoy & Gaimard, 1835)

GASTROPODA:

Haliotis iris Gmelin, 1791
H. australis Gmelin, 1791
Scutus antipodes Montfort, 1810
Tugali elegans Gray, 1843
* Cellana ornata (Dillwyn, 1817)
* C. denticulata (Martyn, 1784)
* C. radians (Gmelin, 1791)
\+ C. stellifera (Gmelin, 1791)
\+ Radiacmea inconspicua (Gray, 1843)
* Notoacmea parviconoidea (Suter, 1907)
* Melagraphia aethiops (Gmelin, 1791)
* Diloma arida Finlay, 1927
* D. zelandica (Quoy & Gaimard, 1834)
Cantharidus opalus (Martyn, 1784)
* C. purpurpeus (Gmelin, 1791)
Trochus Tiaratus Quoy & Gaimard, 1834
\+ T. viridus Gmelin, 1791
\+ Maurea punctulata (Martyn, 1784)
Turbo smaragdus Gmelin, 1791
Cookia sulcata (Gmelin, 1791)
* Littorina unifasciata antipodum Philippi, 1847
* L. cincta (Quoy & Gaimard, 1833)
* Risellopsis varia (Hutton, 1873)
\+ Maoricolpus rosepus (Quoy & Gaimard, 1834)
\+ Serpulorbis zelandicus (Quoy & Gaimard, 1834)
Struthiolaria papulosa (Martyn, 1784)
Sigapatella novaezelandiae Lesson, 1831
Maoricrypta monoxyla (Lesson, 1831)
\+ Tanea zelandica (Quoy & Gaimard, 1832)
\+ Argobuccinum tumidum (Dunker, 1862)
Thais orbita (Gmelin, 1791)

Lepsiella scobina (Quoy & Gaimard, 1833)
* Haustrum haustorium (Gmelin, 1791)
* Lepsithais lacunosus (Bruguiere, 1789)
Penion sulcatus (Lamarck, 1816)
Cominella maculosa (Martyn, 1784)
* C.adspersa (Bruguiere, 1789)
\+ Austrofusus glans (Roeding, 1798)
\+ Buccinulum linea (Martyn, 1784)
\+ B. vittatum littorinoides (Reeve, 1846)
Amalda australis (Sowerby, 1830)
\+ Aclithoe fusus (Quoy & Gaimard, 1833)
Siphonaria zelandica Quoy & Gaimard, 1833
\+ S. cookiana Suter, 1909
\+ Amphibola crenata (Gmelin, 1791)

BIVALVIA:

Barbatia novaezelandiae (Smith, 1915
Glycymeris laticostata (Quoy & Gaimard, 1835)
G. modesta (Angas, 1879)
Mytilus edulis aoteanus Powell, 1958
Perna canaliculus (Gmelin, 1791)
Aulacomya ater maoriana (Iredale, 1915)
\+* Xenostrobus pulex (Lamarck, 1819
\+ Modiolarca impacta (Hermann, 1782)
\+ Atrina zelandica (Gray, 1835)
\+ Ostrea lutaria Hutton, 1873
Pecten novaezelandiae Reeve, 1853
Chlamys zelandiae (Gray, 1843)
\+ Cardita aoteana Finlay, 1927
\+ Paphies australis (Gmelin, 1790)
\+ P. subtriangulatum (Wood, 1828)
Zearcopagia disculus (Deshayes, 1855)
Gari stangeri (Gray, 1843)
\+ Dosinia subrosea (Gray, 1835)
\+ D. maoriana Oliver, 1923
\+ D. anus (Philippi, 1848)
Tawera spissa (Deshayes, 1835)
Protothaca crassicosta (Deshayes, 1835)
Venerupis largillierti (Philippi, 1849)
\+ Chione stutchburyi (Wood, 1820)
\+ Dosina zelandica (Hutton, 1873)
\+ Bassina yatei (Gray, 1835)
\+ Cleidothaerus albidus (Lamarck, 1819)
\+ Myadora striata Quoy & Gaimard, 1835